

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
3 November 2005 (03.11.2005)

PCT

(10) International Publication Number
WO 2005/102635 A1

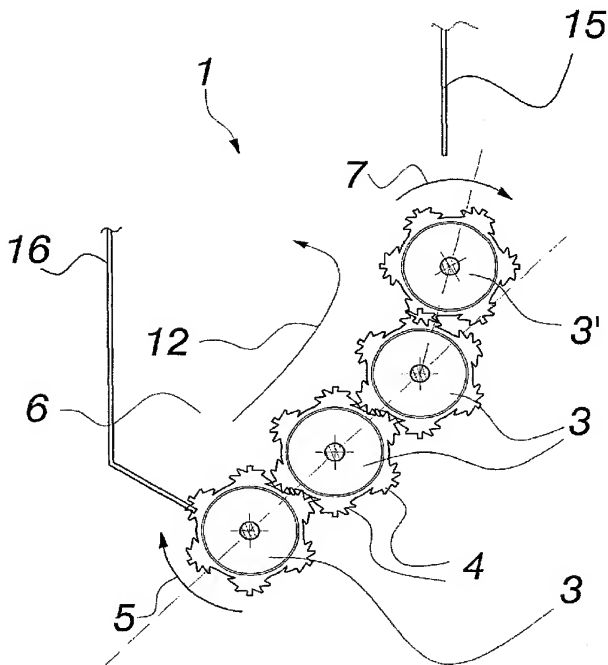
- (51) International Patent Classification⁷: **B27L 1/02**
- (21) International Application Number:
PCT/FI2005/050126
- (22) International Filing Date: 19 April 2005 (19.04.2005)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
20045140 20 April 2004 (20.04.2004) FI
- (71) Applicant (for all designated States except US): **AN-DRITZ OY** [FI/FI]; Tammasaarenkatu 1, FI-00180 Helsinki (FI).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **KOKKO, Pekka** [FI/FI]; Pähkinätie 31, FI-16710 Hollola (FI).
- (74) Agent: **LEITZINGER OY**; Tammasaarenkatu 1, FI-00180 Helsinki (FI).

- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

[Continued on next page]

(54) Title: DEBARKING MECHANISM



(57) Abstract: The invention relates to a debarking mechanism (1) for the decortication or pretreatment of logs (2) for separately performed final debarking and for the discharge of at least some of the bark removed from a wood stream passing through the debarking mechanism, the said debarking mechanism comprising a number of rotatable debarking shafts (3, 3') extending parallel to an advancing direction (A) of the logs (2) to be fed therethrough, which are provided with a number of teeth (4) extending beyond the circumferential surface of the shaft (3, 3'). The debarking shafts (3, 3') are arranged relative to each other in such a way that the logs (2) being processed perform a rotary motion (C) in the debarking mechanism, in which motion the logs (2) are forced in their turn, by the effect of the rotary motion (5) of the debarking shafts (3, 3'), into the upper position, from which they roll down into the lower position on top of the other logs (2) in the debarking machine (1). At least the uppermost debarking shaft (3'), is moved sideways towards the inner part (6) of the debarking mechanism (1) in such a way that the said debarking shaft directs an impact effect on logs (2) colliding with it and moved by the debarking shafts (3) located in a lower position, due to the effect of which the direction of movement of the logs (2) having collided with the said debarking shaft will change in such a way that when dividing the movement into a horizontal and a vertical component, the horizontal

component of the movement will point towards the inner part (6) of the debarking mechanism (1). The circumferential speed of the debarking shaft is selected to be the greater the higher the debarking shaft (3, 3') is positioned. A free passage (7) is arranged for the bark passing over the debarking shaft (3').



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Debarking mechanism

The invention relates to a debarking mechanism for the decortication or pretreatment of logs for separately performed final debarking and for the discharge of at least some of the bark removed from a log stream passing through the debarking mechanism, the debarking mechanism comprising a number of rotatable debarking shafts extending parallel to the advancing direction of the logs to be fed therethrough, which are provided with a number of teeth extending beyond the circumferential surface of the shaft and arranged to strip bark off the logs being processed, transversely to the longitudinal direction of the logs, and at the same time to convey the logs transversely relative to the said shafts, the said shafts, together with the teeth thereof, being arranged to form at least a part of a support surface, on which the logs being processed travel through the debarking mechanism, and the said debarking shafts being arranged relative to each other in such a way that the logs being processed perform a rotary motion in the debarking mechanism, in which motion the logs on the support surface formed by the debarking shafts, are forced, in their turn, by the by the effect of the rotary motion of the debarking shafts, into the upper position, from which they roll down into the lower position on top of the other logs in the debarking mechanism.

This type of prior known debarking mechanisms are provided with fingerplates between the uppermost debarking shaft and the side wall of the debarking mechanism - in some mechanisms also between the debarking shafts - to prevent logs from being wedged between the debarking shaft and the side wall of the debarking mechanism or between two debarking shafts, and thus to prevent the wedged log from being broken.

The bark can usually be discharged from between the debarking shaft and the fingerplate or between two debarking shafts. Bark detached from the

logs in long strips causes problems by clogging the gaps between the uppermost debarking shaft and the related fingerplates, thus causing the bark to collect into big clots at these uppermost fingerplates.

5 In order to eliminate these disadvantages, the debarking mechanism of the invention has been arranged in such a way that of the debarking shafts forming the said part of the support surface for the logs, at least the uppermost debarking shaft has been moved sideways towards the inner part of the debarking mechanism in such a way that the said debarking shaft
10 directs an impact effect on logs colliding with it and moved by the debarking shafts located in a lower position, due to the effect of which the direction of movement of the logs having collided with the said debarking shaft will change in such a way that, when dividing the movement into a horizontal and a vertical component, the horizontal component of movement will point
15 towards the inner part of the debarking mechanism, that the circumferential speed of the debarking shaft is selected to be the greater the higher the debarking shaft is positioned, and that a free passage has been arranged for the bark passing over the uppermost debarking shaft, along which the bark is discharged from the debarking mechanism.

20

The new position of the uppermost debarking shaft has the effect that, at best, the logs cannot rise above this uppermost debarking shaft at all. The arrangement here is that a free passage is arranged for the bark passing over the uppermost debarking shaft, along which the bark is discharged from
25 the debarking mechanism. This may be realized, for example, by arranging an opening in the side wall of the debarking mechanism at the uppermost debarking shaft, in such a way that the bark conveyed by the uppermost debarking shaft are removed from the debarking mechanism through the said opening.

30

It is further arranged that the higher the position of the debarking shaft, the greater the selected circumferential speed of the debarking shaft. On the one hand, this arrangement prevents the logs from being wedged between the debarking shafts and, on the other hand, facilitates the discharge of the bark from debarking mechanism.

After the said uppermost debarking shaft may of course also be arranged further debarking shafts or similar means, for example, for the further conveyance of the bark. What is essential, however, is that any such additional shafts are no longer comprised in the above-mentioned support surface formed by the debarking shafts, on which surface the logs being processed travel through the debarking mechanism. The purpose of the said uppermost debarking shaft is precisely to prevent the logs from entering the area above the said support surface.

Normally, however, provisions must be made for the logs at least occasionally rising above the uppermost debarking shaft. For such a case, the arrangement is preferably such that a guiding surface is fitted in conjunction with the uppermost debarking shaft, the said guiding surface forming, together with the uppermost debarking shaft, a slot converging in the direction of rotation of the debarking shaft. On the one hand, a guiding surface of this type facilitates the entry of the bark into the said slot and, on the other hand, prevents the logs from entering into the slot between the guiding surface and the uppermost debarking shaft.

The guiding surface is preferably provided with grooves for interlocking the said guiding surface and the teeth of the uppermost debarking shaft.

A freely rotating roller or a roller rotated by a suitable actuator has proven to be the most efficient embodiment of the guiding surface.

The invention will be described in greater detail in the following, with reference to the accompanying drawings, in which:

- Figure 1 shows the debarking shafts of a prior art debarking mechanism as a schematic side view.
- Figure 2 shows a section along line II-II in Figure 1.
- Figure 3 shows a section of Figure 2 of the debarking mechanism in accordance with the first embodiment of the invention.
- Figure 4 shows a section according to Figure 2 of the debarking mechanism in accordance with the second embodiment of the invention.
- Figure 5 shows a section according to Figure 2 of the debarking mechanism in accordance with the third embodiment of the invention.
- Figure 6 shows a partial view in the direction of arrow VI in Fig. 5.

The debarking mechanism 1 shown in the drawings is intended for the decortication or pretreatment of logs 2 for separately performed final debarking and for the discharge of at least some of the bark removed from the wood stream passing through the debarking mechanism.

The debarking mechanism 1 comprises a number of rotatable debarking shafts 3, 3' extending parallel to the advancing direction A (Fig. 1) of the logs 2 to be fed therethrough, the ends of the debarking shafts being pivoted on the end plates 13 (Fig. 1) at the ends of the debarking mechanism 1. To rotate the shafts 3, 3', one or both of their ends is provided with, for

example, a sprocket 14. The shafts 3, 3' are rotated in the direction of the arrow 5 (Fig. 2).

5 The debarking shafts 3, 3' are provided with a number of teeth 4 extending beyond the circumferential surface of the debarking shaft and arranged to strip bark off the logs 2 being processed transversely to the longitudinal direction of the logs and at the same time to convey the logs transversely relative to the said debarking shafts.

10 The debarking shafts 3, 3', together with the teeth 4 thereof, form a part of the support surface carrying the logs 2 through the debarking mechanism 1. Figures 1 and 2 show an example of a prior art mechanism comprising four debarking shafts 3, 3', the said shafts being arranged relative to each other so as to form an inclined plane, as can be best seen in Figure 2. The
15 debarking shafts 3, 3' form a sloping plane also in the advancing direction A of the logs. Other than that, the support surfaces are solid surfaces 15, 16 designed so as to provide, together with the support surface formed by the debarking shafts, an open-ended chute extending from one end of the debarking mechanism 1 to the other.

20

The debarking shafts 3, 3' are arranged with each other in such a way that the processed logs 2 perform a rotary motion C in the debarking mechanism, in which motion the logs 2 are forced on the support surface formed by the debarking shafts 3, 3' by the effect of the rotary motion 5 of the debarking
25 shafts 3, 3' in their turn into the upper position, from which they roll down into the lower position on top of the other logs 2 being processed in the debarking mechanism 1.

In the prior art Figures 1 and 2, a fingerplate 11 is arranged above the
30 uppermost debarking shaft 3', the purpose of the fingerplate being to prevent the logs from being wedged between the uppermost debarking shaft

3' and the side wall of the debarking mechanism 1. The bark can usually be discharged from between the debarking shaft 3' and the fingerplate 11 or between two debarking shafts 3 and fall down onto the bark conveyor underneath (not shown).

5

However, especially bark detached in long strips sometimes causes problems by clogging the gaps between the uppermost debarking shaft 3' and the related fingerplates 11, thus causing the bark to collect into big clots at these uppermost fingerplates 11.

10

To eliminate the said problem, Figure 3 shows diagrammatically a solution, in which the uppermost debarking shaft 3', has been moved sideways towards the inner part 6 of the debarking mechanism 1 in such a way that the said debarking shaft directs an impact effect on logs (2) colliding with it and moved by the debarking shafts (3) located in a lower position, due to the effect of which the direction of movement of the logs (2) having collided with the said debarking shaft will change in such a way that, when dividing the movement into a horizontal and a vertical component, the horizontal component of movement will point towards the inner part 6 of the debarking mechanism 1.

20

In a solution according to the invention, the circumferential speed of the debarking shaft 3, 3' is selected to be the greater the higher the debarking shaft 3, 3' is positioned. On the one hand, this arrangement prevents the logs 2 from being wedged between the debarking shafts 3, 3', and on the other hand makes facilitates the removal of the bark from the debarking mechanism 1.

25

When the selected sideways movement of the debarking shaft 3' is extensive enough, the logs 2 are prevented from passing beyond the uppermost debarking shaft 3'. Only the bark can pass beyond the uppermost debarking

30

shaft 3', whereby a free passage 7 has been arranged for this bark, along which it can be removed from the debarking mechanism 1.

5 In the example of Figure 3, the said free passage 7 is formed by an opening arranged in the side wall 15 of the debarking mechanism 1, at the debarking shaft 3', through which opening the bark can freely fall down onto the bark conveyor underneath (not shown).

10 In the solution according to Figure 4, a solid guiding surface 8 has been fitted in conjunction with the uppermost debarking shaft 3', the said guiding surface forming, together with the uppermost debarking shaft 3', a slot 9 converging in the direction of rotation 5 of the debarking shaft 3'. In the example of Figure 4, the guiding surface 8 is a plate-like straight surface, but it may also have a different shape, for example that of an arched surface.

15 The purpose of the guiding surface 8 is primarily to guide the bark as efficiently as possible out of the debarking mechanism 1, but at the same time to prevent logs 2 occasionally passing beyond the uppermost debarking shaft 3' from leaving the debarking mechanism 1 or from being wedged between the uppermost debarking shaft 3' and the side wall 15 of the

20 debarking mechanism 1. The guiding surface 8 is arranged that the bark conveyed by the uppermost debarking shaft 3' collide with it in a sharp angle while travelling towards the slot 9.

25 In the example of Figure 5, the guiding surface 8 is formed by a toothless, freely rotating or independently rotatable roller resembling the debarking shafts 3, 3' in structure, whereby the teeth 4 of the uppermost debarking shaft force the bark to be discharged through the slot 9 between the uppermost debarking shaft 3' and the roller 8.

30 The guiding surface 8 is - regardless of whether it is a rotating or fixed guiding surface, or whether the guiding surface has a plate-like, cylindrical or

some other form - preferably provided with grooves 10 for interlocking the said guiding surface and the teeth 4 of the uppermost debarking shaft 3' and for thus forming a slot 9 of the desired size (Fig. 6). Due to this arrangement, bark that has been pushed through the slot 9 at some point as
5 forced by the tooth 4, can no longer easily return through the slot 9, whereby the adjacent teeth 4 will force also the rest of the bark strip to pass through the slot 9. The movable guiding surface 8 formed by the rotatable or freely rotating roller further facilitates the entry of the bark into the slot 9 and out of the debarking mechanism 1 therethrough..

Claims

1. A debarking mechanism (1) for the decortication or pretreatment of logs (2) for separately performed final debarking and for the discharge of at least some of the bark removed from a wood stream passing through the debarking mechanism, the said debarking mechanism comprising a number of rotatable debarking shafts (3, 3') extending parallel to the advancing direction (A) of the logs (2) to be fed therethrough and provided with a number of teeth (4) extending beyond the circumferential surface of the shaft (3, 3') and arranged to strip bark off the logs (2) being processed, transversely to the longitudinal direction of the logs, and at the same time to convey the logs transversely relative to said shafts (3, 3'), the said shafts (3, 3') being, together with the teeth (4) thereof, arranged to form at least a part of a support surface on which the logs (2) being processed travel through the debarking mechanism (1), and the said debarking shafts (3, 3') being arranged relative to each other in such a way that the logs (2) being processed perform a rotary motion (C) in the debarking mechanism, in which motion the logs (2) on the support surface formed by the debarking shafts (3, 3') are forced in their turn, by the effect of the rotary motion (5) of the debarking shafts (3, 3'), into the upper position, from which they roll down into the lower position on top of the other logs (2) in the debarking mechanism (1), characterized in that of the debarking shafts (3, 3') forming the said part of the support surface for the logs (2), at least the uppermost debarking shaft (3') has been moved sideways towards the inner part (6) of the debarking mechanism (1) in such a way that the said debarking shaft directs an impact effect on logs (2) colliding with it and moved by the debarking shafts (3) located in a lower position, due to the effect of which the direction of movement of the logs (2) having collided with the said debarking shaft will change in such a way that, when dividing the movement into a horizontal and a vertical component, the horizontal component will point towards the inner part (6) of the debarking mechanism

(1), that the circumferential speed of the debarking shaft is selected to be the greater the higher the debarking shaft (3, 3') is positioned, and that a free passage (7) is arranged for the bark passing over the uppermost debarking shaft (3'), along which the bark is discharged from the debarking
5 mechanism (1).

2. A debarking mechanism as set forth in claim 1, characterized in that in conjunction with the uppermost debarking shaft (3') is fitted a guiding surface (8), the said guiding surface forming, together with the uppermost
10 debarking shaft (3'), a slot (9) converging in the direction of rotation (5) of the debarking shaft (3').

3. A debarking mechanism as set forth in claim 2, characterized in that the guiding surface (8) is provided with grooves (10) in order to interlock the
15 said guiding surface and the teeth (4) of the uppermost debarking shaft (3').

4. A debarking mechanism as set forth in claim 2 or 3, characterized in that the guiding surface (8) is formed by a freely rotating roller.

20 5. A debarking mechanism as set forth in claim 2 or 3, characterized in that the guiding surface (8) is formed by a rotatable roller.

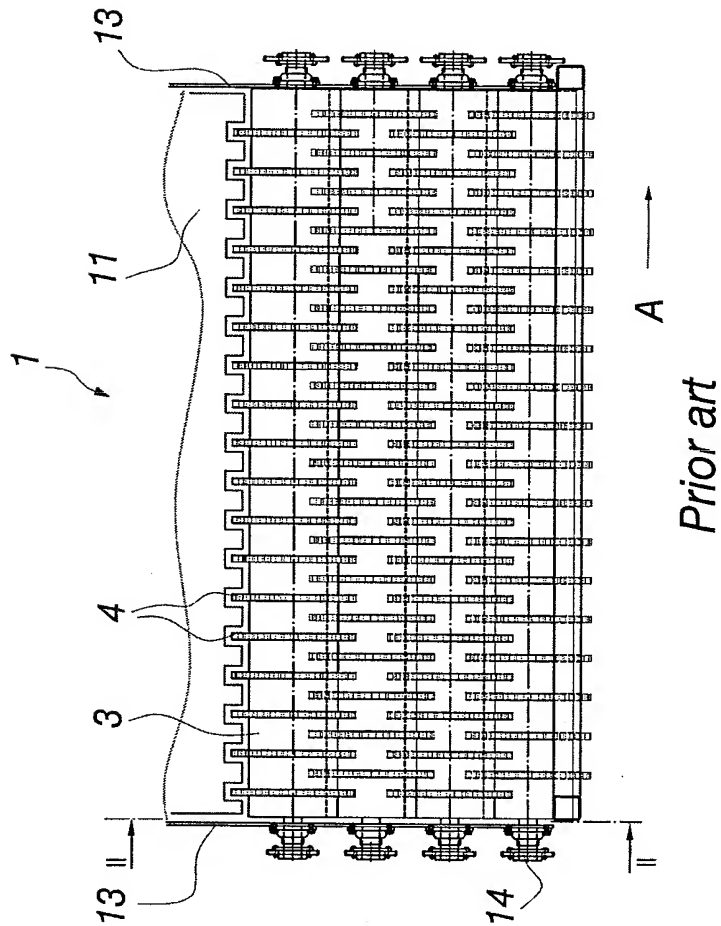


Fig. 1

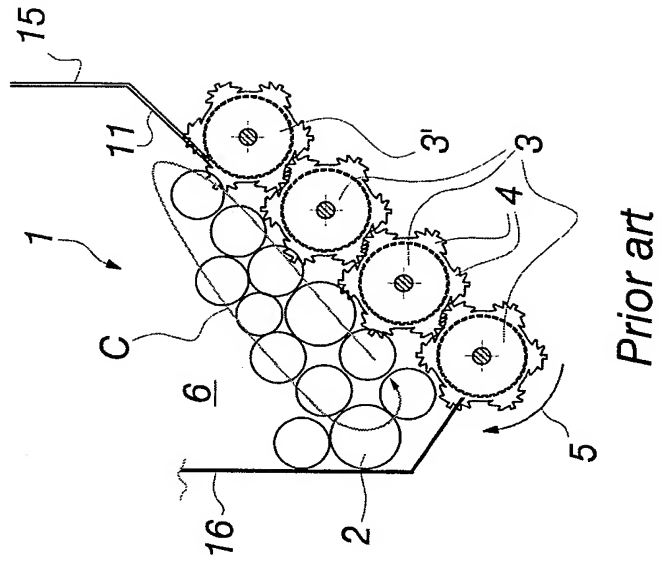


Fig. 2

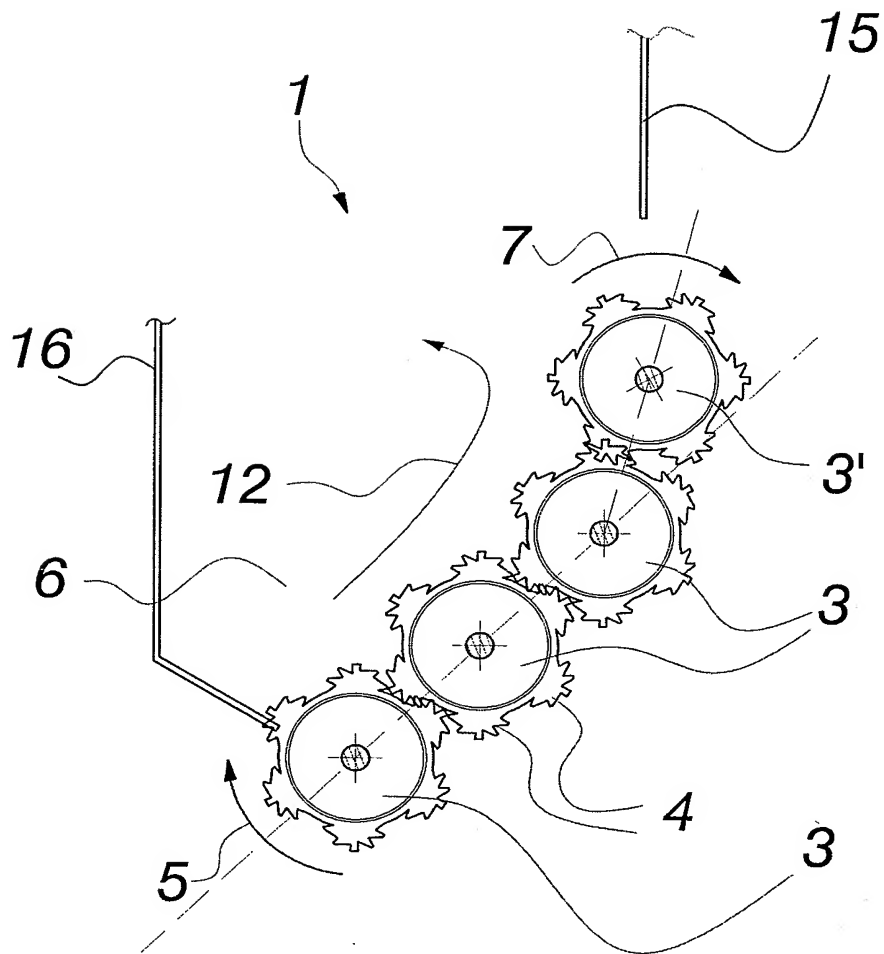


Fig. 3

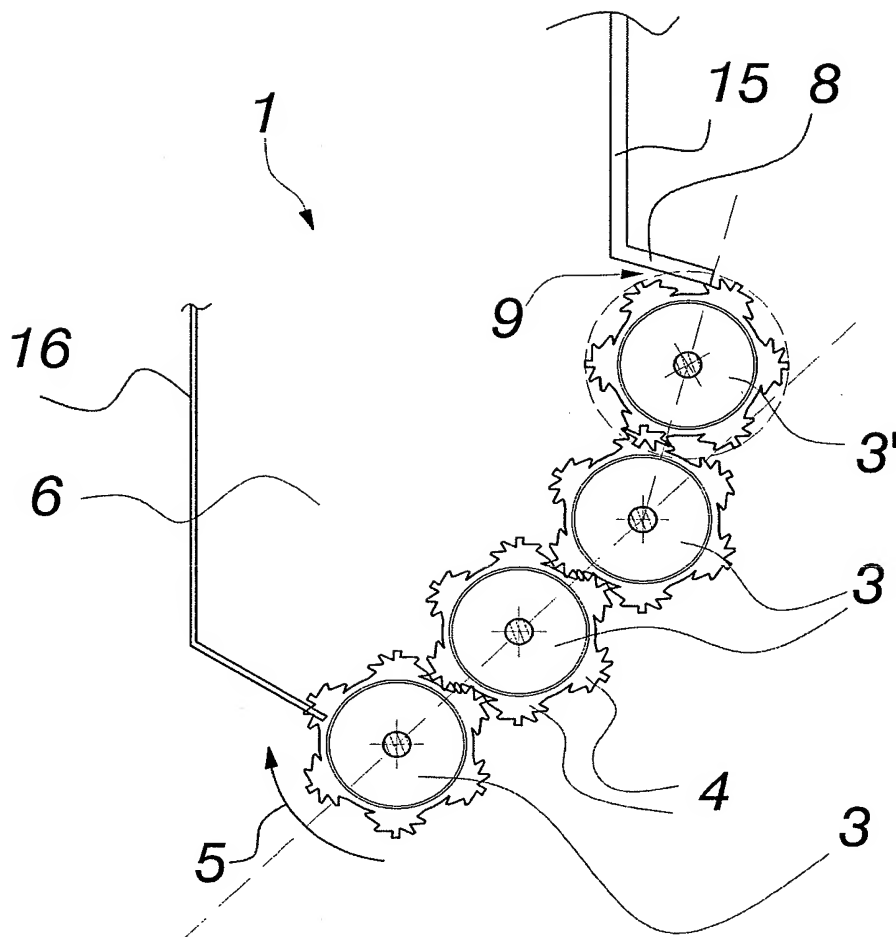


Fig. 4

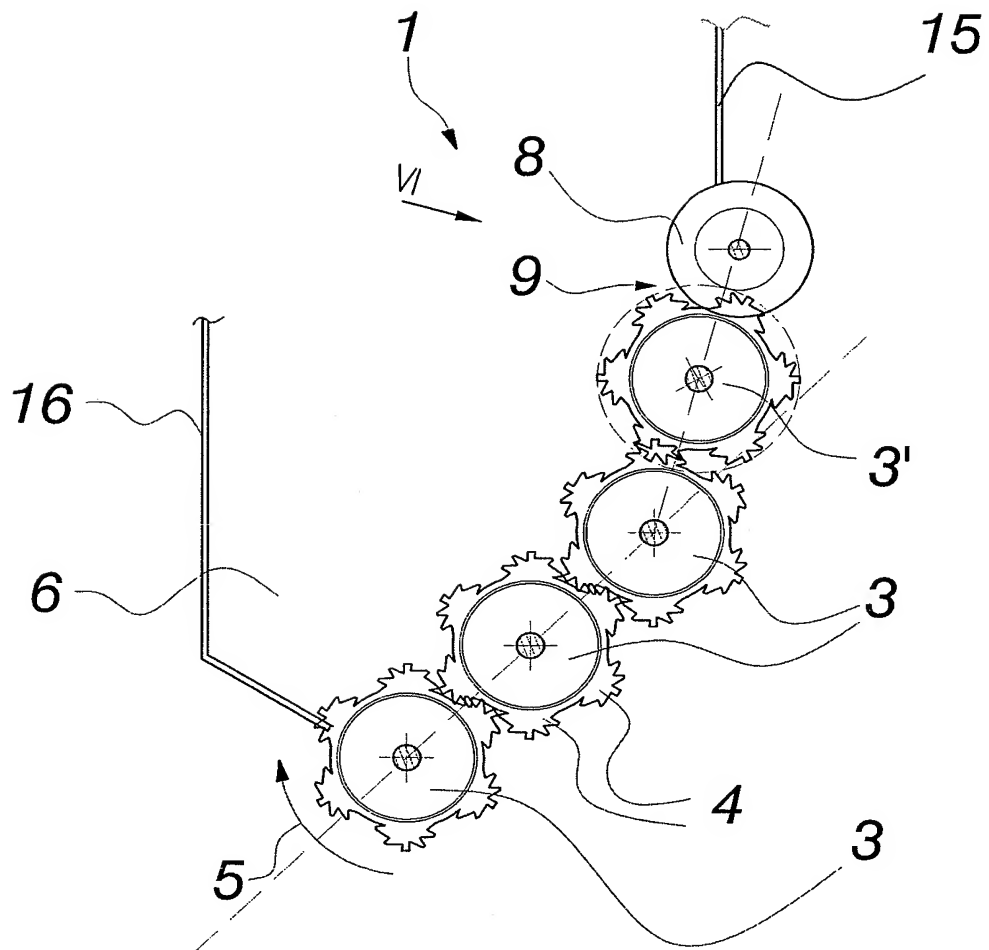


Fig. 5

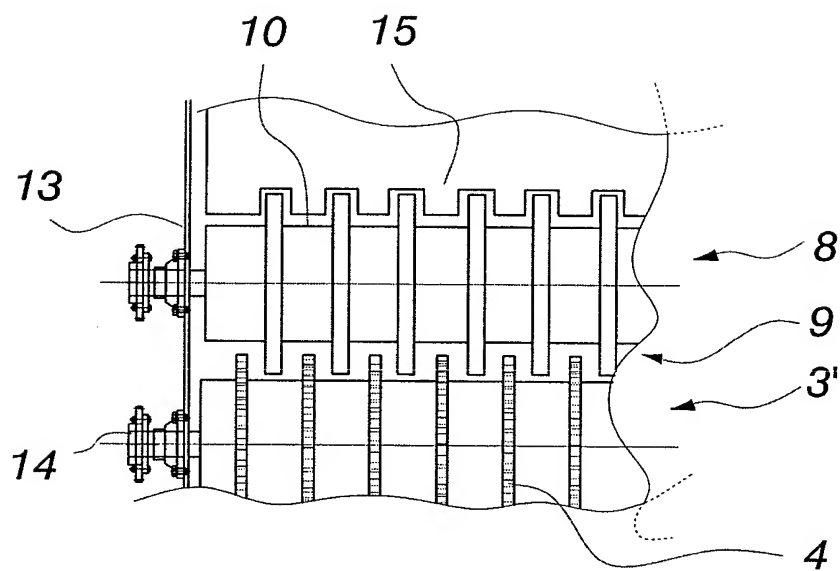


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 2005/050126

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B27L 1/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B27L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20030159760 A1 (VICTOR PEETSO ET AL), 28 August 2003 (28.08.2003), page 1, column 2, paragraph 0014, line 7-9 --	1-5
A	FI 112181 B (ANDRITZ OY); 14 November 2003 (14.11.2003) --	1-5
A	SE 8007901 A (LARSSON JOHN), 12 May 1982 (12.05.1982), figure 1 --	1-5
A	FI 28777 A (ERKKI IKÄVALKO ET AL), 30 April 1957 (30.04.1957) -- -----	1-5

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

25 August 2005

Date of mailing of the international search report

29-08-2005

Name and mailing address of the ISA/

Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Eddy Leopold/MP
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

08/07/2005

International application No.

PCT/FI 2005/050126

US	20030159760	A1	28/08/2003	CA	2419762	A	25/08/2003
				US	20040114133	A	17/06/2004

FI	112181	B	14/11/2003	BR	0208819	A	09/03/2004
				CA	2438614	A	24/10/2002
				CN	1501854	A	02/06/2004
				DE	10296635	T	22/04/2004
				FI	20010756	A	12/10/2002
				NO	20034522	A	09/10/2003
				SE	0302425	A	11/09/2003
				WO	02083382	A	24/10/2002

SE	8007901	A	12/05/1982	NONE			

FI	28777	A	30/04/1957	NONE			

PUB-NO: WO2005102635A1
DOCUMENT-IDENTIFIER: WO 2005102635 A1
TITLE: DEBARKING
MECHANISM
PUBN-DATE: November 3, 2005

INVENTOR-INFORMATION:

NAME	COUNTRY
KOKKO, PEKKA	FI

ASSIGNEE-INFORMATION:

NAME	COUNTRY
ANDRITZ OY	FI
KOKKO PEKKA	FI

APPL-NO: FI2005050126
APPL-DATE: April 19, 2005

PRIORITY-DATA: FI20045140A (April
20, 2004)

INT-CL (IPC) : B27L001/02

EUR-CL B27L001/02 ,
(EPC) : B27L001/10